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ADULT AND JUVENILE COHO SALMON ENUMERATION AND CODED-WIRE TAG RECOVERY ANALYSIS FOR ZOLZAP CREEK, BC, 1995

prepared by

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ABSTRACT

Nass, B.L. 1997. Adult and juvenile coho salmon enumeration and coded-wire tag recovery analysis for Zolzap Creek, BC, 1995. Can. Manuscr. Rep. Fish. Aquat. Sci. 2423: viii + 41 p.

Adult and juvenile coho migrations were monitored at Zolzap Creek, British Columbia, as part of the 1995-1996 Nisga'a Aboriginal Fisheries Strategy. Smolt trapping was conducted from mid-April to mid-June using an in-stream wire-mesh fence. A total of 12,557 coho smolts were captured during the trapping period, and an unknown number migrated out during periods when the fence was not operational. Of those captured, 10,156 were released with coded-wire tags. Migration timing, mean length and weight at age, and age composition are presented.

Adult coho escapement was monitored using an in-stream fence and carcass surveys. The counting fence was operational between 5 September and 6 December. A total of 908 adult coho were counted at the fence. Adipose-clip rate was 34.0% for adult coho. Age and length characteristics of adult males and females are presented.

Canadian and US commercial harvests were examined using coded-wire tag recovery data obtained from the Mark-Recovery Program. Total commercial exploitation rate on Zolzap Creek coho in 1995 was 67.7% (12.9% Canadian, 54.8% US). Of the total commercial catch of Zolzap Creek coho, Canadian catch accounted for 19.0% and the US catch accounted for an estimated 81.0%. Harvests occurred over a wide area ranging from Canadian Statistical Area 6 (Butedale) to the Northern Outside Statistical Area in Alaska (northwest of Juneau, AK). Canadian harvests were largest in Statistical Area 3 for both the net and troll fisheries. US harvests were confined entirely to Alaska with largest in the Southern Inside Statistical Area for the net fishery and the Central Outside Statistical Area for the troll fishery. Total survival was 3.6% and smolt-to-spawner survival was 1.0%.

RÉSUMÉ

Nass, B.L. 1997. Adult and juvenile coho salmon enumeration and coded-wire tag recovery analysis for Zolzap Creek, BC, 1995. Can. Manuscr. Rep. Fish. Aquat. Sci. 2423: viii + 41 p.

Les migrations de saumons coho, adultes et jeunes, ont été mesurées au ruisseau Zolzap, en Colombie-Britannique, dans le cadre de la Stratégie des pêcheries autochtones des Niagas. De la mi-avril à la mi-juin, on a procédé à la capture de saumoneaux grâce à une barrière en toile métallique installée dans le cours d'eau. En tout, 12 557 saumoneaux coho ont été capturés pendant la période de piégeage, un nombre inconnu de poissons passant pendant les périodes où la barrière n'était pas opérationnelle. Sur l'ensemble des saumoneaux capturés, 10 156 ont été remis à l'eau avec une marque magnétique codée. La période de migration, la longueur moyenne, le poids et la composition selon l'âge sont présentés.

La remonte de saumons coho adultes a été surveillée grâce une barrière installée dans le cours d'eau et à l'observation des carcasses. La barrière de comptage était opérationnelle entre le 5 septembre et le 6 décembre. En tout, 908 saumons coho adultes ont été dénombrés à la barrière. Le taux d'ablation de la nageoire adipeuse était de 34,0 % pour les saumons coho adultes. On présente les caractéristiques d'âge et de longueur pour les mâles et les femelles adultes.

Les récoltes commerciales canadiennes et étatsuniennes ont été examinées grâce aux données de récupération des marques magnétiques codées provenant du Programme de marquage-récupération. Pour 1994, le taux d'exploitation commercial total de saumons coho au ruisseau Zolzap a été évalué à 67,7 % (12,9 % pour le Canada, 54,8 % pour les États-Unis). Sur le total de prises commerciales de saumon coho au ruisseau Zolzap, le Canada en comptait 19,0 % et les États-Unis 81,0 % (valeurs estimatives). Les récoltes couvraient un vaste secteur, s'étendant de la zone statistique canadienne 6 (Butedale) à la zone statistique extérieure nordique en Alaska (au nord-ouest de Juneau, en Alaska). Les récoltes canadiennes étaient les plus importantes dans la zone statistique 3, aussi bien pour la pêche au filet qu'à la traîne. Les récoltes étatsuniennes se limitaient entièrement à l'Alaska, les plus importantes se situant dans la zone statistique intérieure méridionale pour la pêche au filet, et dans la zone statistique extérieure centrale pour la pêche à la traîne. On estimait le taux de survie total à 3,6 %, et le taux de survie des saumoneaux par rapport au géniteurs à 1,0 %.

INTRODUCTION

As part of an agreement between the Nisga'a Tribal Council and the Canadian Government, an Interim Measures Program (IMP) was established for fisheries research in the Nisga'a Traditional Territory, British Columbia. One component of this large research initiative focused on the assessment of juvenile and adult coho populations in tributaries to the Nass River. Juvenile and adult coho enumeration studies have been conducted on Zolzap Creek since 1992 (Nass 1996a; Nass 1996b; Nass and English 1994; Nass 1996c; Nass 1997). This report presents results for studies conducted at Zolzap Creek in 1995.

The objectives of the research were to:

1. Enumerate migrating juvenile coho and estimate escapement;
2. Document the timing, size, and age distribution of migrating coho;
3. Coded-wire tag coho smolts to enable the determination of oceanic harvest rates;
4. Monitor the escapement for marked (CWT) adult coho, and determine oceanic exploitation and survival rates; and
5. Collect data which will enable the future examination of the relationships between physical environmental factors and coho smolt migration timing, and between adult escapement and smolt production.

Achievement of these objectives involved the construction and operation of in-stream, semi-permanent, panel fences located approximately 0.5 km upstream of the mouth of Zolzap Creek.

STUDY STREAMS

Zolzap Creek is a tributary to the Nass River, located in northwestern British Columbia (Fig. 1 and 2). Zolzap Creek flows for 6 km in a northwesterly direction between Nisga'a Lava Bed Memorial Park and the Kitimat Mountain Range to its confluence with the Nass River, 5 km downstream of Gitwinksihlkw. The main channel of the creek is regularly interrupted by beaver dams and log jams. The substrate is highly variable and ranges between silty particulate, to granite cobble, and coarse pumice. Major flow contributions come from Lava Creek (3 km in length) which flows from the lava beds and numerous small creeks that flow from the steep alpine. Intermittent flows of water from the Nass River and Vedder Creek are possible during flooding periods. The mouth of Zolzap Creek enters a side channel to the Nass River known as Zolzap Slough. The lower 0.5 km of Zolzap Creek regularly becomes inundated when water levels on the Nass River are high. Zolzap Creek supports many species of salmonids including coho (*Oncorhynchus kisutch*), pink (*O. gorbuscha*), chum (*O. keta*), sockeye (*O. nerka*), rainbow (*O. mykiss*), cutthroat (*O. clarki*), and Dolly Varden (*Salvelinus malma*). Non-coho species

include lampreys (family Petromyzontidae), sticklebacks (family Gasterosteidae), and sculpins (family Cottidae). Coho escapement was estimated to be 1,561 in 1992 (Nass 1996b) , 1,048 in 1993 (Nass 1996c) and 2,536 in 1994 (Nass 1997).

JUVENILE COHO STUDIES

METHODS

Trapping Operations

An in-stream, semi-permanent enumeration fence was located 0.5 km upstream of the creek mouth. Fence design was based on Conlin and Tutty (1979) and minor modifications were made according to site characteristics and available materials. The fence was built in a W pattern and spanned the entire creek bed. Three by eight foot panels were constructed of 2"x 4"s covered with 1/4" wire-mesh. Three-eighths inch and ½" rebar were used to anchor the panels to the stream bed. Burlap sandbags and heavy duty garden sheeting were used to build a solid and fish tight seal along the base of the panels. Two hinged panels were installed in each of the fence wings for emergency release of excess water head in the case of floods. Plywood trap boxes with Vexar-screened windows (to allow water exchange) were anchored at each down-stream apex and connected to the fence via 8" "Big O" tubing. Additional boxes were made for holding fish after processing and were designed with a small escape door to be used for releasing fish. A 2 m x 2 m fyke net was also used during flooding periods to assess downstream migration. The net was positioned in front of one apex of the fence. Provisions for upstream migrating adults were made by constructing a simple trap consisting of a wire-mesh panel extending out from the stream bank to one wing of the fence. Plywood was used to cover the adult trap area.

Previous studies (Nass 1997) indicated that juvenile coho may be leaving Zolzap Creek at times of the year other than during the traditional spring migration period. To assess abundance and size composition of juvenile coho during fall freshets, downstream moving juveniles were captured during the period September to December using a 1.3 m diameter floating rotary trap (E.G. Solutions, Inc., Corvallis, OR). This trap consists of two large pontoons and an aluminum mesh cone supported between them. With the large end of the cone facing the current, the cone rotates about an axle and funnels downstream moving fish into a submerged trap box. The cone provides for a maximum fishing depth of approximately 0.6 m. The trap was anchored using cables attached to cement blocks on each side of the stream. The trap was located 100 m above the fence site on the downstream side of the culverts passing under the road to Lakalzap. The rotary trap was checked twice a day to ensure proper operation and to remove any captured fish.

Physical Observations

Crews monitored water temperatures, water levels, and weather daily. An electronic data logger (Unidata America, Lake Oswego, OR) was used to record daily maximum and minimum water temperature and level. In addition, crews recorded temperature using a maximum-minimum thermometer and water level using staff gauges calibrated to the nearest 0.01 m.

Water level gauges were located within 50 m of the trapping site (one upstream, one downstream of the fence). Precipitation was recorded on a scale of zero to five with zero representing no precipitation and five being heavy precipitation.

Juvenile Enumerations

Daily numbers of coho smolts captured at the fence were obtained from the coded-wire tagging machine or counts conducted manually. Fence mortalities were added accordingly. Coho smolts were identified as juveniles equal to or greater than 70 mm in length. Coho smaller than 70 mm tended to be dark with distinct parr marks and lacking the silver colouration associated with smoltification. Therefore, this group consisted of pre-smolts and fry. All coho pre-smolts and fry, and non-coho species were counted and released downstream of the fence during sorting. Upstream migrating fish caught in the adult traps were counted and released upstream.

Biosampling

A random sample of up to 25 smolts (i.e., coho greater than or equal to 70 mm) were obtained from each day's catch. These smolts were anaesthetized and measured for fork length and weighed using an electronic scale (0.1 g). Scale sampling followed the stratified method of Ketchen, described by Ricker (1975); age sample data (column X on Table 3) included non-random samples, and length sample data (column Y on Table 3) and the calculated age representation is based on random sampling. Crews attempted to collect at least 10 scale samples from each 5 mm size class of coho for the study period. Smolts of the required sizes were selected from the catch when the random sample did not provide the necessary sizes. Scale samples were interpreted by the Fisheries and Oceans Canada Scale Lab, Vancouver, BC. Secondary quality control checks were performed to ensure a reliable age designation. Scale ages are reported in Gilbert-Rich notation where freshwater age 2 coho (i.e., having survived two winters from egg deposition) have a single freshwater annulus.

Coded-wire Tagging

Coded-wire tagging at Zolzap Creek was performed using a Mark IV tagging machine by Northwest Marine Technology Ltd. (Shaw Island, WA). An MS-222 bath was used to anaesthetize smolts prior to tagging. All tagged fish were adipose fin clipped (AFC). Numbers of coho smolts tagged were recorded according to tag code (only one code was used in 1995). All tagged smolts were directed to a holding box in the stream and allowed to fully recover from the tagging operation before being released.

Tag retention checks for each tag code were conducted to determine the proportion of tags remaining in a sample of smolts. This was accomplished by retaining a sample of tagged coho smolts (minimum of 200 smolts) in a holding box until the following day. Next, individual smolts from the holding box were slightly anaesthetized and passed through the coded-wire tagging machines quality control device (QCD) to check for the presence of a coded-wire tag.

Coho smolts not possessing a tag were checked a second time. The total number of tags detected was recorded from the CWT counter.

RESULTS

Physical Observations

Water temperatures during the smolt migration period at Zolzap Creek ranged from a minimum of 6.7° C in late April to a maximum of 12.1° C in mid-June (Fig. 3). Water level was steady from mid-April to the beginning of May when major flooding occurred. Zolzap Creek rose approximately 1.6 m from its minimum level. Water velocity decreased to a negligible rate once it rose above the fence, at which time the water applied little pressure to the fence structure. Low velocity at high water levels at Zolzap Creek is caused by the creek backing up when water levels of the Nass River are high.

Fish Enumerations

The Zolzap Creek juvenile counting fence was operated from 23 April to 15 June, 1995. The fence was topped by water for the periods 10 May to 18 May, 27 May to 30 May, and 10 June to 15 June. A fyke net was used to capture migrating smolts during the periods 29 May to 30 May and 11 June to 15 June. No fishing was conducted for the periods 11 May to 18 May, 28 May, and 10 June.

The juvenile rotary trap was operated from 19 September to 10 November, and 19 November to 2 December. A total of 322 smolt-sized coho and 263 presmolt coho were captured. Assuming a rotary trap efficiency of 10%, approximately 6,000 juvenile coho moved downstream of the trap during the period of operation.

Coho Smolts: A total of 12,557 coho smolts were counted at the fence and fyke net combined (Table 1). During this period, there were 21 pre-tagging mortalities (0.1%). The maximum number of smolts captured at the fence was 1,551 and occurred on 20 May (Table A-1). An unknown number of smolts moved past the fence during flooding periods. There were a total of 4,883 fry and pre-smolt coho counted and released during trapping operations (Table A-1).

Non-coho Species: Lampreys (ammocetes and young adults) were caught in the largest numbers followed by Dolly Varden and cutthroat (Table 2; Table B-1).

Biosampling

Age: The calculated freshwater age structure of coho smolts was 55.1% age 2, 37.9% age 3, and 7.0% age 4 (Table 3).

Length and Weight: The mean fork length of age 2 smolts was 95.9 mm and the mean weight was 9.2 g (Table 3). Age 3 smolts averaged 104.3 mm and 11.3 g. Coho aged as 4 years old ranged between 95 mm and 165 mm. The length-frequency distribution showed substantial overlap between age 2 and age 3 coho (Fig. 5). Both age 2 smolts and age 3 smolts were most numerous in the 100 - 105 mm length class. Age 3 coho smolts were significantly larger than age 2 smolts (t-test, $p < 0.0001$). Overall, coho smolts averaged 100.6 mm in length.

Juvenile coho captured during the fall trapping period were measured for fork length. Mean length of smolt-sized coho was 93.2 mm (SD = 15.2).

Coded-wire Tagging

Mean tag retention was 99.9% (Table 4). Crews conducted nine tests for tag code 18-20-51 for a total of 2,646 samples.

Releases of adipose fin clip coho totalled 10,166 (Table 5; Table C-1). Crews recorded 122 mortalities associated with the tagging process. The total number of coho smolts released with coded-wire tags was 10,156. Eighteen percent (2,203) of the captured coho smolts were released untagged during the study period. The total number of smolts released was 12,369.

ADULT COHO STUDIES

METHODS

Population Estimates

An aluminum conduit fence anchored to a crib-type sill was constructed at Zolzap Creek. All salmonids caught at the fence were counted and classified by sex. Sex was distinguished on the basis of length and body morphology. Previous studies at Zolzap Creek (Nass 1996b, 1996c, 1997) have shown an absence of jacks in the escapement and therefore, all males were classified as adults. Each coho was tagged on the operculum with a uniquely numbered Ketchum kurl-lock tag and measured for length. During handling, fish were examined for fin clips or tags that would be associated with coded-wire tagging or mark-recapture studies taking place on the Nass River. All captured fish were released upstream of the fence.

Coho carcasses were recovered on the fence and in upstream surveys and checked for operculum tags (mark and recapture). This year, carcasses were available only in the lower 2 km of the creek as freezing hampered surveys further upstream.

Age, Length, and Sex Composition

All live coho captured at the fence were measured for postorbital-hypural length and examined for fin clips and sex. Adipose tissue was collected opportunistically for DNA analysis. DNA samples were analysed at the Pacific Biological Station (T. Beacham, Fisheries and Oceans

Canada, Nanaimo, BC, pers. comm.). Sex ratios were calculated from total fence captures. Mean lengths were calculated for adult males and adult females. Crews attempted to sample at least 25 coho a day for scales (10 scales per fish). Scale samples were interpreted by the Fisheries and Oceans Canada scale lab, Vancouver, BC Secondary quality control checks were performed to ensure reliability of the age designations. Scale ages are reported in Gilbert-Rich notation where freshwater age 2 coho (i.e., having survived two winters from egg deposition) have a single freshwater annulus.

Coded-wire Tag Recoveries

Coded-wire-tagged smolts were adipose fin clipped (AFC) prior to release for future identification in the fishery and the escapement. Coho smolts at Zolzap Creek were coded-wire-tagged (CWT) in the spring of 1994 (Nass 1997) and 1995 during their out-migration.

Escapement: Crews examined all coho captured at the fence for the presence or absence of the adipose fin. The contribution and survival of AFC coho to the escapement was determined using methods presented in Bocking et al. (1992) and modified in Nass (1997). CWT heads were collected from sacrifices at the fence, the native net and angling fisheries, and through carcass recoveries. In addition, seining operations were conducted at nearby Spencer's Lake on the Tseax River to examine coho for fin clips. Separate CWT codes had been released in the Tseax as part of a small enhancement operation using Tseax origin broodstock (Alexander and Nass 1996). Nass (1996c, 1997) indicated straying between the Tseax and Zolzap was likely given their close proximity and the observed differences between mark rates at release and return.

Commercial and Sport Harvests: Commercial and sport catches of CWT fish are monitored by the Fisheries and Oceans Canada and various US agencies and compiled in the Mark Recovery Program (MRP). Data on CWT releases and recaptures are used to estimate the number of fish from a particular stock that have been harvested in the commercial and sport fishery, as well as determining the spatial and temporal distribution of harvests (Kuhn et al. 1988, Nass 1997). The estimates include catch (observed catch corrected for sampling effort), expanded catch (estimated catch corrected for unmarked fish), exploitation rate (proportion of CWT coho caught in the fishery), and total return (expanded catch plus escapement).

Geographic Distribution of Harvest: Coded-wire-tagged fish in the commercial catch are recorded by Canadian and US fishery Statistical Areas. To estimate number of recoveries for each Canadian area, the observed CWT catch was expanded by the mean catch-sampling ratio observed in the Catch Region (e.g., Northern Troll = Stat Areas 1, 3, 4, and 6). Similarly, US troll catch was expanded using the catch sampling ratio by quadrant (e.g., northwest) and the net catch sampling ratios, by district.

RESULTS

Physical Observations

During the period that the adult fence was operational, water temperatures ranged from a maximum of 12.4° C in mid September to a minimum of 0.4° C in December (Fig. 3). Water level rose a maximum of 0.5 m from its base flow during freshets (Fig. 3).

Adult enumerations

The fence was operated continuously and fish tight from 5 September to 6 December. A total of 908 adult coho salmon were counted at the fence (Table 6). Of these, 875 adults were operculum tagged and released upstream. Maximum daily migration past the fence was 490 adults on 14 October (Table D-1) although there were four major pulses of coho past the fence during operation (Fig. 6). Crews examined a total of 55 adult coho carcasses collected on the fence and in upstream surveys (fence to 2 km) (Table 6). All 55 carcasses had been tagged at the fence, therefore no mark-recapture estimate was calculated. Upstream surveys to Goat Creek (a tributary) were conducted on 20 and 24 November to collect CWT heads and assess opercular tag rates.

For non-coho species captured at the fence, Dolly Varden had the greatest abundance (81), followed by pinks (52), and cutthroats (28). Adult chum (8), sockeye (7) and lamprey (2) were also captured at the fence. Chum, pinks and sockeye were caught in their greatest numbers in mid-September, however their total numbers were down substantially from 1994. Trout were caught primarily in mid October and were more numerous than in 1994. No population estimates were derived for non-coho species.

Age, Length, and Sex Composition

A total of 132 coho were sampled for scales, of which 121 were successfully aged (Table 7). Unaged samples included 11 marine regenerates. Adult males and females had different age compositions which averaged 46.8% and 31.0% freshwater age 2, and 53.2% and 69.0% freshwater age 3, respectively. The total age composition was 41% age 2 and 59% age 3. All aged scales were recorded as marine age 1 (i.e., having 1 marine annulus).

Mean lengths of adult males and females were 48.3 cm (n=470, SD=9.0) and 54.1 cm (n=435, SD=5.1), respectively. Adult male coho were widely distributed over the range of 28 to 68 cm with a mode of 54 cm (Fig. 7). Female coho had a mode of 52 cm with a range of 37 to 68 cm. Adult males captured at the fence (n=470) were slightly more abundant than females (n=435). A total of fifty (50) adipose tissue samples were collected.

Coded-wire Tag Recoveries

Escapement: Crews examined 906 adult coho for fin clips of which 308 were AFC (34.0%; Table 8). An estimated 309 adipose clipped adult coho returned to Zolzap Creek in 1995. Smolt to spawner survival (i.e., includes natural and harvest mortality) for adult coho was estimated at 1.0%.

Sixty-nine (69) CWT heads were collected at Zolzap Creek and 3 were collected at Tseax River. Of the Zolzap recoveries, 28 were from sacrifices at the fence, 13 were from carcass recoveries, 26 were from the native net fishery below the fence, and 5 were from the native angling fishery below the fence. Total tag retention was 95.8% (69 of 72 recoveries). All the CWT's (Zolzap and Tseax) were from the 1994 release at Zolzap Creek (codes 18-09-22 and 18-09-33).

Commercial and Sport Harvests: Total observed Zolzap Creek coho CWT recoveries were 43 and 153 (Table 9) for Canadian and US (Alaska) fisheries, respectively. Observed sport recoveries totalled 4 for the US fisheries. All CWT recoveries were from the 1994 release year. Northern Canadian troll and net catch-to-sample ratios were 3.6 and 2.6, respectively, while US troll and net ratios were 3.2 and 5.3, respectively (Table 9). Estimated Zolzap Creek CWT coho catches were 136 and 595 for Canadian and US fisheries, respectively (Table 9). Using the CWT mark ratio at release (MRP method), expanded Canadian and US catches were 160 and 698, respectively, for a total of 858 (Table 10). Using the adipose-clip ratio at recovery (i.e., escapement method), expanded Canadian and US catches were 400 and 1,749, respectively, for a total of 2,149 (Table 10).

Total commercial exploitation rate (Canadian and US combined) on Zolzap Creek coho was 67.7%. Total Canadian exploitation rate was 12.9% (8.1% troll, 4.8% net) and total US exploitation rate was 54.8% (31.6% troll, 23.2% net). Of the total commercial catch of Zolzap Creek coho, Canadian fisheries accounted for 19.0% and the US accounted for 81.0%. Canadian troll and net fisheries accounted for 36.8% and 63.2% of the total Canadian catch, respectively. US troll and net fisheries accounted for 42.3% and 57.7% of the total US catch, respectively. Estimated total adult return for Zolzap Creek coho was 1,217 and 3,057 using the MRP and escapement methods, respectively (Table 10). Total survival was 3.6%.

Geographic Distribution of Harvest: Commercial harvest of Zolzap Creek coho occurred over a wide area ranging from Canadian Statistical Area 6 to the US Northern Outside Statistical Area in Alaska (Fig. 8). Canadian harvests were largest in Statistical Area 3 for both the net (6.0%) and troll fisheries (7.4%; Table 11). US harvests were largest in the Southern Inside Statistical Area for the net fishery (17.8%) and the Central Outside Statistical Area for the troll fishery (22.0%; Table 11).

DISCUSSION

JUVENILE COHO STUDIES

Trapping operations captured approximately 5,000 juvenile coho designated as fry and presmolts as based on their size and colouration. This is substantially higher compared to 1994 (462; Nass 1997), 1993 (1,051; Nass and English 1994), and 1992 (486; Nass 1996a). This early movement of juvenile coho may have been the result of high spawner abundance and/or concentrated spawning in 1994. Total escapement was estimated to be approximately 2,500 in 1994 and is the highest on record (Jantz et al. 1989). In addition, it is likely that a substantial proportion of spawning occurred in the lower 2 km of the creek in 1994 because of low water levels and freezing in the traditional spawning areas. It is possible that the unusually high number of spawners using the lower reaches of the creek may have caused overcrowding of the available rearing habitat for fry.

In a previous study, Nass (1997) suggested that juvenile coho may be leaving Zolzap Creek at times of the year other than during the traditional spring migration period. Downstream movement of juvenile coho was monitored at Zolzap Creek between September and December using a rotary trap. An estimated 6,000 juvenile coho passed the trapping location during this period and supports the concept of variable out-migration timing. However, no fin clipping was conducted to determine if downstream migration was complete or the movements constituted only instream milling. Mean length of smolt-sized coho (93.2 mm) was moderately smaller compared to smolts measured during the 1995 spring migration (100.6 mm).

Age 2 and age 3 smolts comprised 56.1% and 37.3% of the 1995 migrating population, respectively. These age 2 smolts are the offspring of the 1993 escapement of 1,048 coho and age 3 smolts are the offspring of the 1992 escapement of 1,831.

ADULT COHO STUDIES

Adult coho counted at the fence totalled 908. After CWT sacrifices, escapement was 878 plus an undetermined number of coho that spawned below the fence. A native fishery harvested approximately 120 coho below the fence. Although probably less than the native fishery, a sport fishery harvested an unknown number of coho.

Counts of other salmonids at the fence indicated that: 1) chum were substantially lower in 1995 (n=8) compared to 1994 (n=68) as were sockeye (1995 n=7, 1994 n=28); and 2) Dolly Varden (n=81) and cutthroat trout (n=28) in 1995 were more abundant compared to 1994 (n=10, n=14, respectively).

Data from 1992 to 1994 have suggested that there are no jacks in the Zolzap Creek escapement (Nass 1996b, 1996c, 1997). In 1995, CWT and scale ageing data have confirmed the absence of jacks in the population. More specifically, we decoded CWT's from 69 heads taken from coho that measured between 28 and 66 cm (post-orbital-hypural) and found all to be from

1994 releases. Eighteen of the samples were from coho measuring less than 35 cm. This length has been used in previous studies at other BC streams to designate jacks in the escapement and is based on CWT analysis. The results of this CWT analysis agree with scale ageing which indicated all samples were of marine age 1.

For the third year of adult returns with coded-wire tags, the adipose clip rate at return was substantially lower than the adipose clip rate at release. In 1994, adipose-fin clipped smolts represented an estimated 72% of the out-migration (Nass 1997). The observed AFC rate at return in 1995 was 34%. The difference between AFC rates at release and return can be attributed to an unknown number of unmarked out-migrants and/or substantial straying to or from the creek (Nass 1996c, 1997). If the difference was due to unmarked out-migrants, the total migration of smolts leaving in 1994 would have been 86,931 using the adjusted Petersen model. Some straying of adults from Zolzap Creek was confirmed in 1995. Three CWT heads recovered at the Tseax River were from CWT releases at Zolzap Creek in 1994. Therefore, it is likely that straying to Zolzap may also occur.

Zolzap Creek CWT coho have been subjected to total exploitation rates between 63% and 72% and have had total survival rates between 2.1% and 8.9% (1993-1995). Using the adipose-clip ratio at recovery, expanded Canadian and US catches were substantially lower in 1995 (400 and 1,749, respectively) compared to 1994 (1,829 and 5,280, respectively). Other North Coast coho systems have shown similar rates of exploitation. For the period 1989 to 1994, Lachmach River coho had exploitation rates ranging between 61% and 78%, and Toboggan Creek coho experienced rates between 39% and 68% (Skeena-Kitimat Sustainable Fisheries Program, 1996). Total survival of Lachmach coho (4 to 20%) has been higher than Zolzap coho (2.1% to 8.9%) and Toboggan coho (1 to 5%) for the past three years.

In Alaska, comprehensive information exists for several southeast stocks, including Hugh Smith Lake (Southern Inside Statistical Area, see Fig. 8), which has been monitored since 1982. Preliminary data for the 1995 return suggests exploitation rates of 9.0% Canadian and 66.0% US (75.0% total; Leon Shaul, Alaska Dept. of Fish and Game, Douglas, AK, pers. comm.). Southeast Alaska and Canadian fisheries accounted for approximately 88% and 12% of the commercial catch of Hugh Smith coho, respectively. The total exploitation rate on Hugh Smith coho was similar to exploitation rates of 12.9% Canadian and 54.8% US (67.7% total) on Zolzap Creek coho in 1995. Preliminary CWT data for the 1995 return of Hugh Smith coho suggest a survival rate of 14.5% which is substancially higher than for Zolzap Creek coho at 3.6%. Hugh Smith coho have had substancially higher survivals (1994: 19.2%, 1993: 18.1%) compared to Zolzap coho (1994: 8.9%, 1993: 2.1%) in the past 2 years.

RECOMMENDATIONS

1) Construct a higher smolt fence to allow for continued fishing during flooding events. Total catch and CWT application in 1995 was relatively low (approximately 10,000) compared to preferred CWT releases of 20,000.

2) Continue directed effort at recovering CWT heads from the escapement at Zolzap Creek and Tseax River. Collect CWT heads using catch and release netting or angling, carcass recovery and the native fisheries to allow for the assessment of straying between the Tseax River and Zolzap Creek and provide CWT tag retention rates. This will provide additional data on straying.

3) Continue sacrificing a small number (e.g., 25) of small AFC males for CWT recovery and decoding. This information will allow for confirmation of the size-at-age relationship in male coho observed in this study.

4) Collect an additional 50 adipose tissue samples to increase the total number available for DNA analysis.

ACKNOWLEDGEMENTS

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TABLES

Table 1. Juvenile coho catch at Zolzap Creek enumeration fence, by week, 1995.

Week ending	Fry and presmolts	Smolts	Pre-tagging smolt morts
29-Apr	66	144	1
6-May	342	1041	2
13-May	118	1085	0
20-May	178	1883	2
27-May	581	3825	6
3-Jun	2184	1827	3
10-Jun	1201	2631	6
17-Jun	213	121	1
Total	4883	12557	21

Table 2. Non-coho catch at Zolzap Creek juvenile enumeration fence, 1995.

Species	Life stage	No. captured [a]
Steelhead	juvenile	12
	adult	0
Cutthroat	juvenile	67
	adult	43
Dolly Varden	juvenile	518
	adult	28
Sockeye	juvenile	189
Cottid	-	480
Lamprey	-	2314
Stickleback	-	127

[a] all fish were captured moving downstream.

Table 3. Age-length distribution of Zolzap Creek coho smolts, 1995.

Size-Class (mm)	Age Sample (X)	Age-groups in X			Length Sample (Y)	Calculated Age Representation in Y		
		2	3	4		2	3	4
70	3	3	0	0	3	3.0	0.0	0.0
75	5	5	0	0	5	5.0	0.0	0.0
80	9	9	0	0	12	12.0	0.0	0.0
85	28	27	1	0	35	33.8	1.3	0.0
90	55	49	6	0	86	76.6	9.4	0.0
95	92	61	27	4	127	84.2	37.3	5.5
100	129	71	50	8	195	107.3	75.6	12.1
105	99	46	45	8	148	68.8	67.3	12.0
110	65	24	36	5	100	36.9	55.4	7.7
115	42	13	21	8	65	20.1	32.5	12.4
120	15	4	9	2	30	8.0	18.0	4.0
125	8	2	5	1	12	3.0	7.5	1.5
130	4	0	3	1	8	0.0	6.0	2.0
135	3	0	3	0	4	0.0	4.0	0.0
140	1	0	1	0	1	0.0	1.0	0.0
145	0	0	0	0	0	0.0	0.0	0.0
150	0	0	0	0	1	0.0	0.0	0.0
155	1	0	0	1	1	0.0	0.0	0.0
160	0	0	0	0	1	0.0	0.0	0.0
165	1	0	0	1	1	0.0	0.0	1.0
Mean length (mm)	99.9	95.9	104.3	108.9	100.6			
SD	10.9	9.6	9.4	14.6	11.0			
Mean weight (g)	10.3	9.2	11.3	13.1	10.4			
SD	3.7	2.8	3.4	6.7	3.7			
Total samples	560	314	207	39	835	459	315	58
% contribution		56.1	37.0	7.0		55.1	37.9	7.0

Table 4. Coded-wire tag retention rates for Zolzap Creek coho smolts, 1995.

Sample date	Tagging date	Tag code	Hours held	Sample size	No. tags lost	Percent retention
6-May	4-May	182051	48	200	0	100.0
21-May	20-May	182051	24	200	0	100.0
22-May	21-May	182051	24	200	0	100.0
23-May	22-May	182051	24	200	0	100.0
24-May	23-May	182051	24	200	0	100.0
25-May	24-May	182051	24	200	1	99.5
1-Jun	31-May	182051	24	200	0	100.0
2-Jun	1-Jun	182051	24	136	0	100.0
3-Jun	2-Jun	182051	24	200	0	100.0
4-Jun	3-Jun	182051	24	200	0	100.0
5-Jun	4-Jun	182051	24	200	1	99.5
6-Jun	5-Jun	182051	24	110	0	100.0
8-Jun	6-Jun	182051	48	200	0	100.0
9-Jun	8-Jun	182051	24	200	0	100.0
		Total		2646	2	99.9

Table 5. Coded-wire tagged coho smolt releases from Zolzap Creek, 1995.

Tag code	Week Ending tagging dates	No. AFC	No. morts	No. released AFC	No. tagged [a]	No. AFC only [b]	No. released untagged [c]	Total release [d]	CWT mark rate [e]
182051	29-Apr	60	5	55	55	0	83	138	-
182051	6-May	776	21	755	754	1	263	1018	1.35
182051	13-May	0	0	0	0	0	1081	1081	-
182051	20-May	1819	7	1812	1810	2	38	1850	1.02
182051	27-May	3557	34	3523	3519	4	254	3777	1.07
182051	3-Jun	1676	25	1651	1649	2	147	1798	1.09
182051	10-Jun	2400	30	2370	2368	2	217	2587	1.09
182051	17-Jun	0	0	0	0	0	120	120	-
	Total	10288	122	10166	10156	10	2203	12369	1.22

[a] No. tagged (corrected for tag loss) = No. released AFC - (No. released AFC * No. lost tags / No. sampled); see Table 4.

[b] No. AFC only = No. released AFC - No. tagged

[c] No. released untagged = the number of unmarked fish released which belong to the same group as the tagged and AFC only fish.

[d] Total release = No. tagged + AFC only + untagged

[e] CWT mark rate = Total release / No. tagged

Table 6. Adult coho enumerations and carcass recoveries at Zolzap Creek fence, 1995.

Item	No. of adults
Number live coho captured at fence	908
Number of live coho released untagged	3
Number of coho sacrificed at the fence	30
Number live coho operculum tagged	875
Number coho carcasses recovered	55
Number of coho carcasses recovered untagged	0
Number of coho carcasses recovered with lost tags	3

Table 7. Freshwater age distribution of adult coho at Zolzap Creek, 1995.

Sex	Age 2		Age 3		Total aged	Total unaged	Total sampled
	No.	%	No.	%			
Adult males	37	46.8	42	53.2	79	9	88
Adult females	13	31.0	29	69.0	42	2	44
Total adults	50	41.3	71	58.7	121	11	132

Table 8. Estimates of total escapement of adipose clipped coho and contribution to escapement at Zolzap Creek, 1995.

	No. examined (A)	No. with adipose clips (B)	% marked (C=B/Ax100)	Population estimate (D)	% sampled (E=A/Dx100)	Estimated adipose clips (F=B/AxD)	No. smolts [a]		Contribution to escapement [c]	Smolt to spawner (%) [d]
							AFC	unclipped [b]		
Adult	906	308	34.0	908	99.8	309	29615	4804	359	1.0

[a] from Nass (1997).

[b] an unknown number of additional unclipped releases were likely.

[c] marked contribution to escapement = estimated adipose clips * (clipped + unclipped) / clipped

[d] % survival = estimated adipose clips / clipped * 100

Table 9. Estimated Canadian and American commercial and sport harvest of Zolzap Creek CWT coho in 1995 using tag recovery data (Mark Recovery Program, Fisheries and Oceans, Canada).

Tag	Observed CWT catch [a]				Catch-sample ratio [b]			Estimated CWT catch [c]			
code	N. Troll	N. Net	Sport	Total	N. Troll	N. Net	Sport	N. Troll	N. Net	Sport	Total
Canadian											
180922	5	6	0	11	3.4	2.8	0.0	17	17	0	34
180933	19	13	0	32	3.6	2.5	0.0	69	33	0	102
Total	24	19	0	43	3.6	2.6	0.0	86	50	0	136
American											
180922	12	7	1	20	2.8	6.6	4.0	34	46	4	84
180933	91	39	3	133	3.3	5.1	4.0	300	199	12	511
Total	103	46	4	153	3.2	5.3	4.0	334	245	16	595
								Total commercial			715
								Total sport			16
								Total native fishery [d]			26
								Total escapement [e]			312
								Total CWT			1069

[a] Observed CWT = CWT's recovered from the commercial and sport catch

[b] Cumulative catch-sample ratio = total coho catch / total coho sampled

[c] Estimated CWT = observed CWT catch * catch sampling ratio

[d] observed harvest

[e] Estimated CWT's (adipose clips corrected for tag loss at return) plus recoveries at Tseax River; see Table 8

Table 10. Expanded Canadian and American commercial and sport harvest of Zolzap Creek coho and estimated total return, 1995.

Tag code	Total release	Smolts tagged [a]	Mark rate [b]	Expanded catch [c]									Contribution escap.	Total return [d]
				Canadian				American				Grand Total		
				Troll	Net	Sport	Total	Troll	Net	Sport	Total			
180922	9600	7337	1.31	28	19	0	47	40	53	4	97	144		
180933	24819	21982	1.13	107	40	0	147	392	262	15	669	816		
Total 1 [e]	34419	29319	1.17	101	59	0	160	392	288	19	698	858	359	1217
Total 2 [f]			2.94	253	147	0	400	982	720	47	1749	2149	908	3057

[a] Number smolts released with tags (corrected for tag loss), Nass (1997).

[b] Mark rate at release = No. released / No. tagged

[c] Expanded catch = EST * mark rate at release

[d] Total return = expanded catch + escapement

[e] Total 1 expanded catch is calculated using the total mark rate at release and the total estimated catch for all tag codes (Table 9).

[f] Total 2 expanded catch is calculated using the total adipose clip rate at recovery and the total estimated catch for all tag codes (Table 9).

Table 11. Estimated commercial harvest distribution of Zolzap Creek CWT coho by area and gear type, 1995. Percentage is of total commerical harvest (does not include sport recoveries).

Area [a]	Net	%	Troll	%	Total	%
Canada						
1	0	0.0	31	4.3	31	4.3
3	43	6.0	53	7.4	96	13.4
4	7	1.0	0	0.0	7	1.0
6	0	0.0	2	0.3	2	0.3
subtotal	50	7.0	86	12.0	136	19.0
U.S.A. (Alaska)						
Northern Outside	0	0.0	34	4.8	34	4.8
Central Outside	0	0.0	157	22.0	157	22.0
Southern Outside	85	11.9	54	7.6	139	19.4
Southern Inside	127	17.8	45	6.3	172	24.1
Central Inside	23	3.2	4	0.6	27	3.8
Southern Intermediate	10	1.4	25	3.5	35	4.9
Stephen Passage	0	0.0	0	0.0	0	0.0
Lynn Canal	0	0.0	0	0.0	0	0.0
Central Intermediate	0	0.0	15	2.1	15	2.1
subtotal	245	34.3	334	46.7	579	81.0
TOTAL	295	41.3	420	58.7	715	100.0

[a] includes respective sub-areas

FIGURES

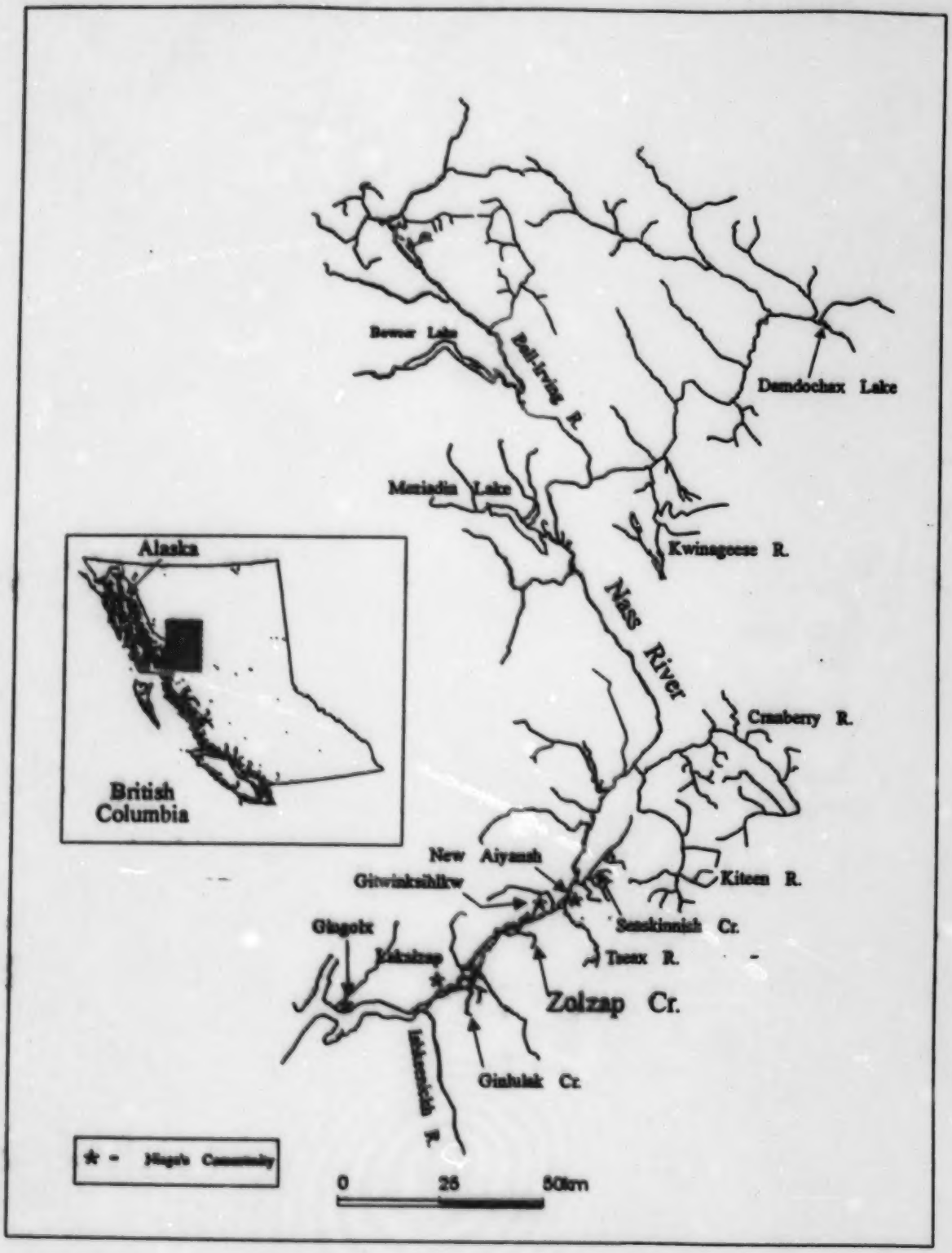

Figure 1. The Nass River watershed, British Columbia.

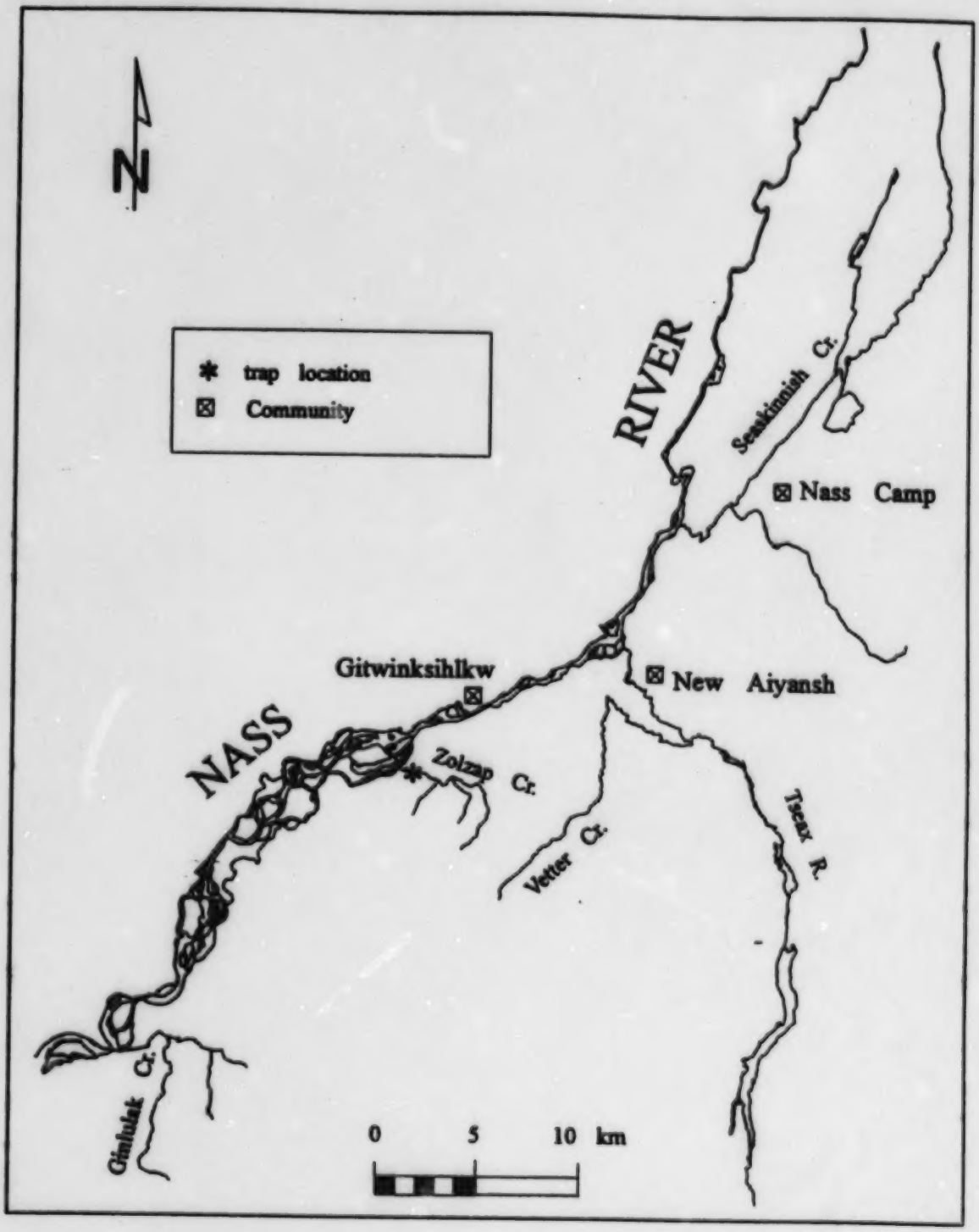

Figure 2. Zolzap Creek and location of enumeration fence.

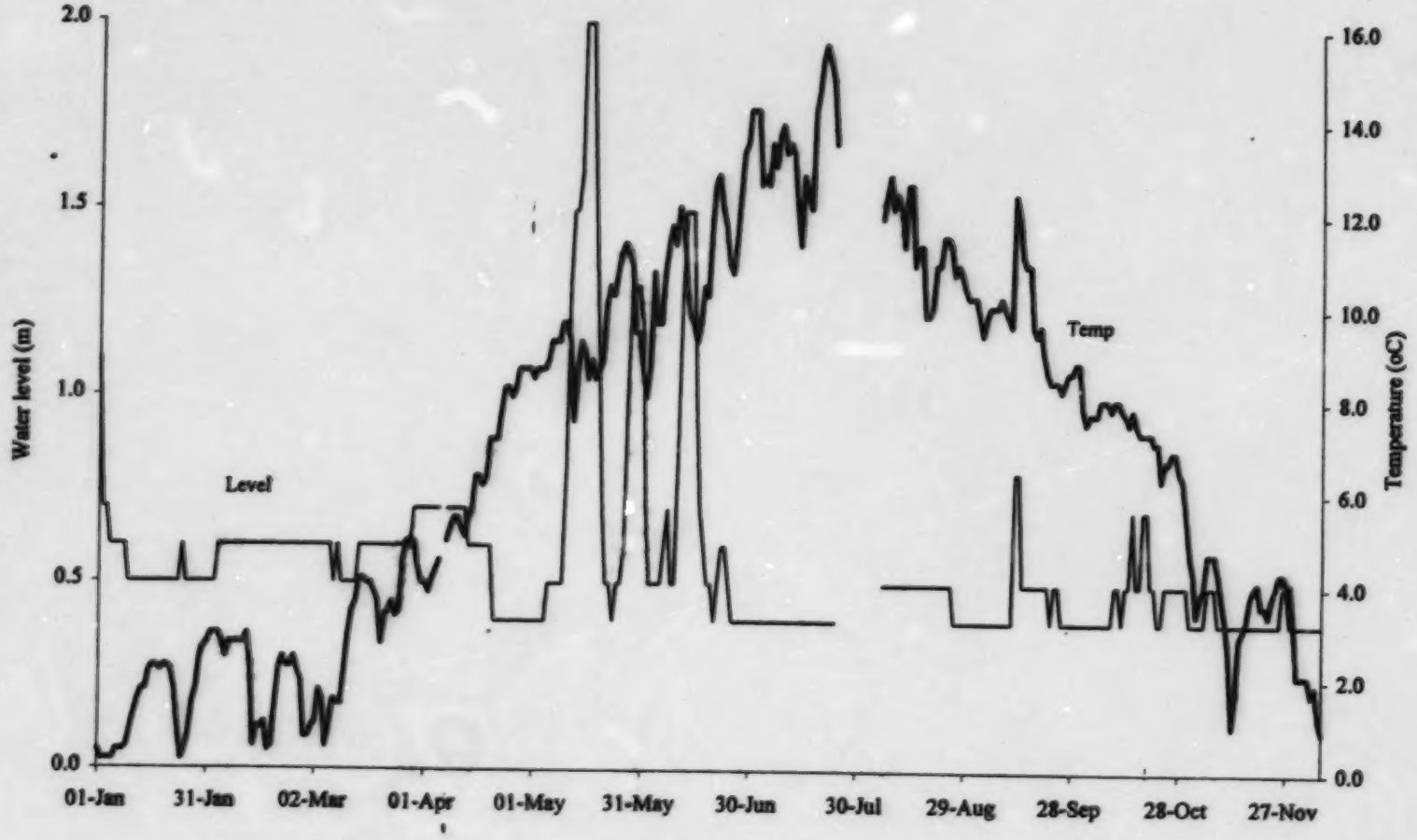

Figure 3. Water level and temperature at Zolzap Creek, 1995.

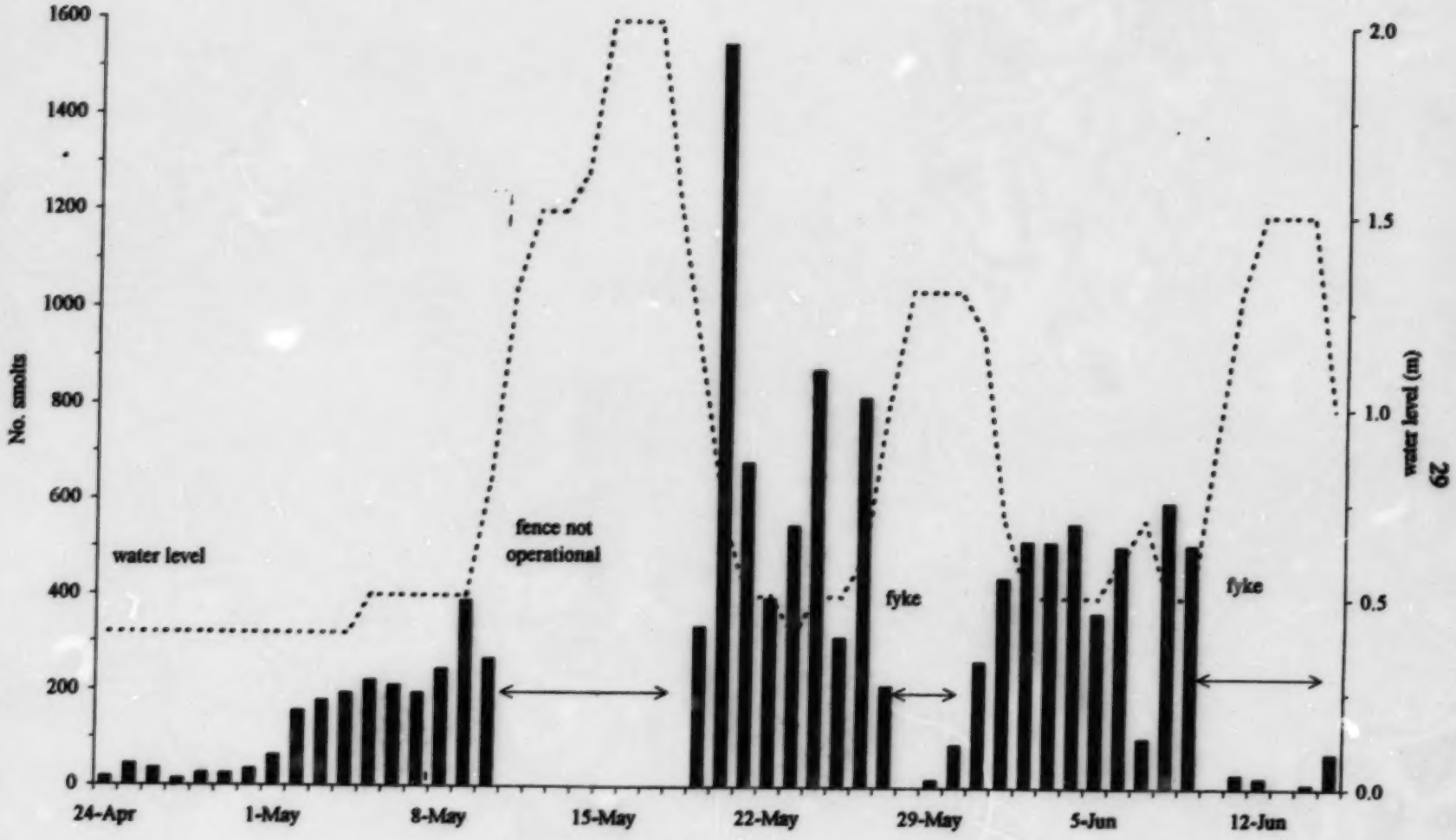

Figure 4. Daily migration of coho smolts at Zolzap Creek, 1995

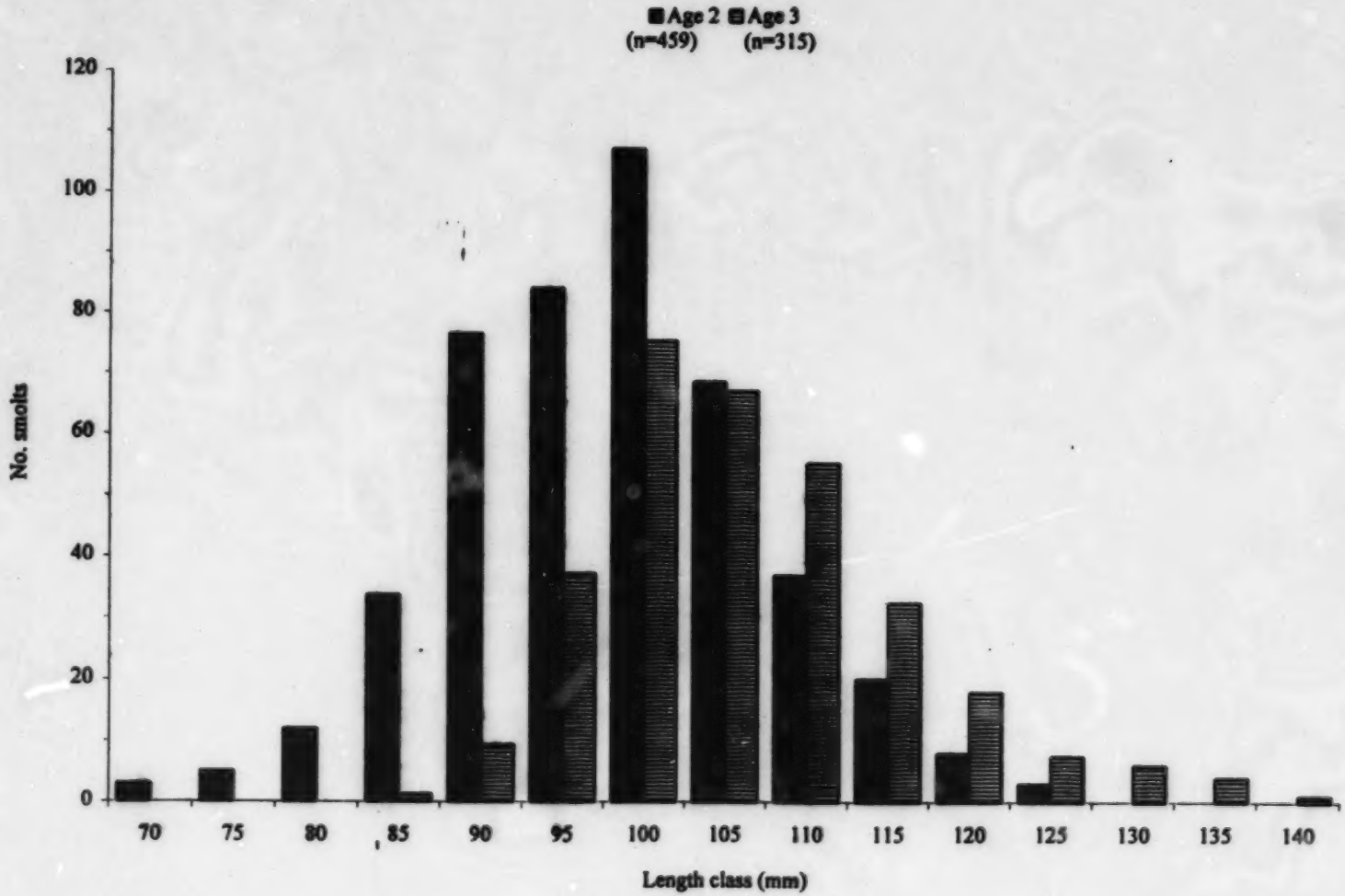

Figure 5. Length frequency and calculated age distribution of Zolzap Creek coho smolts, 1995. Age 4 samples are excluded for clarity (see Table 3).

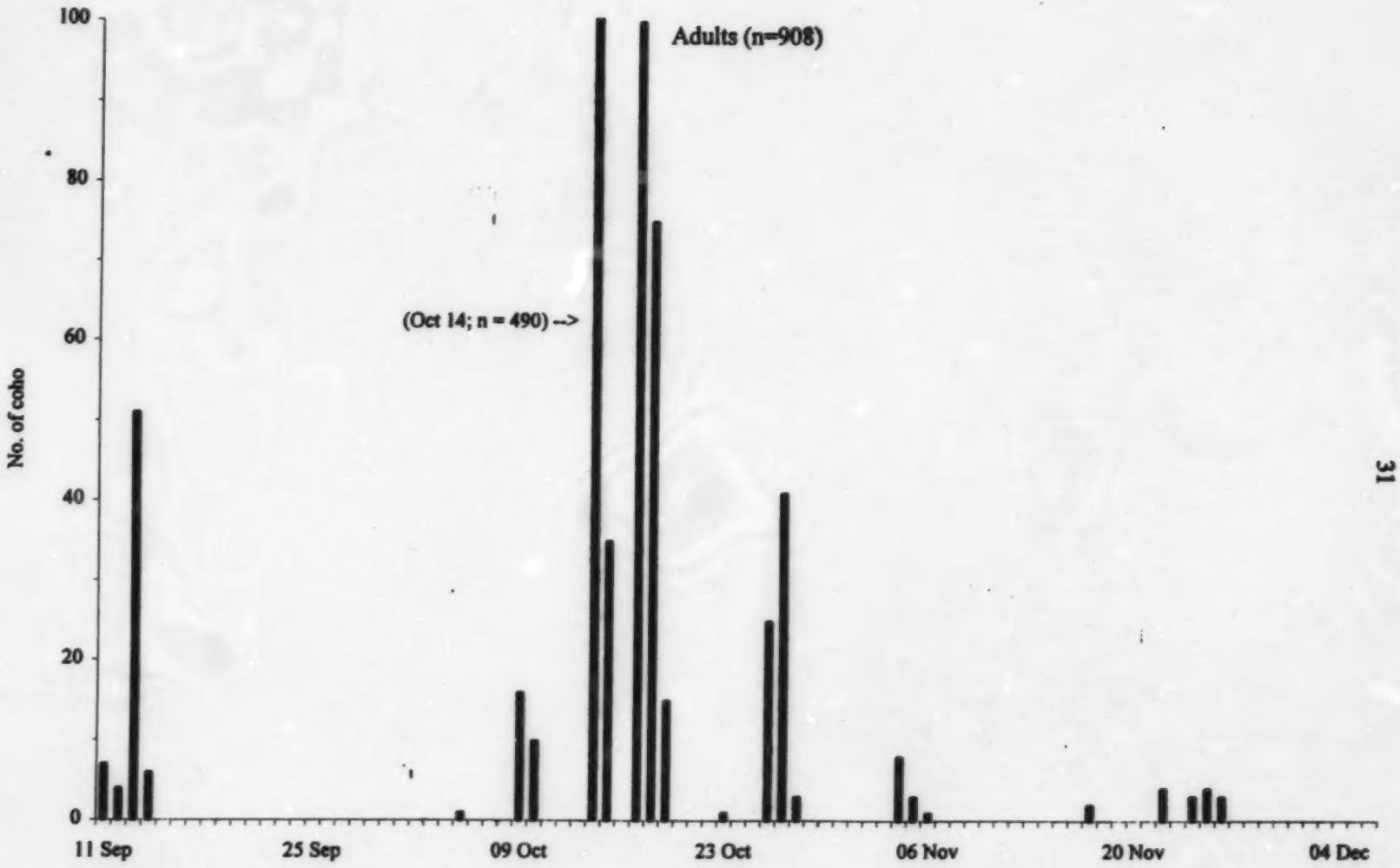

Figure 6. Daily counts of adult coho at the Zolzap Creek enumeration fence, 1995.

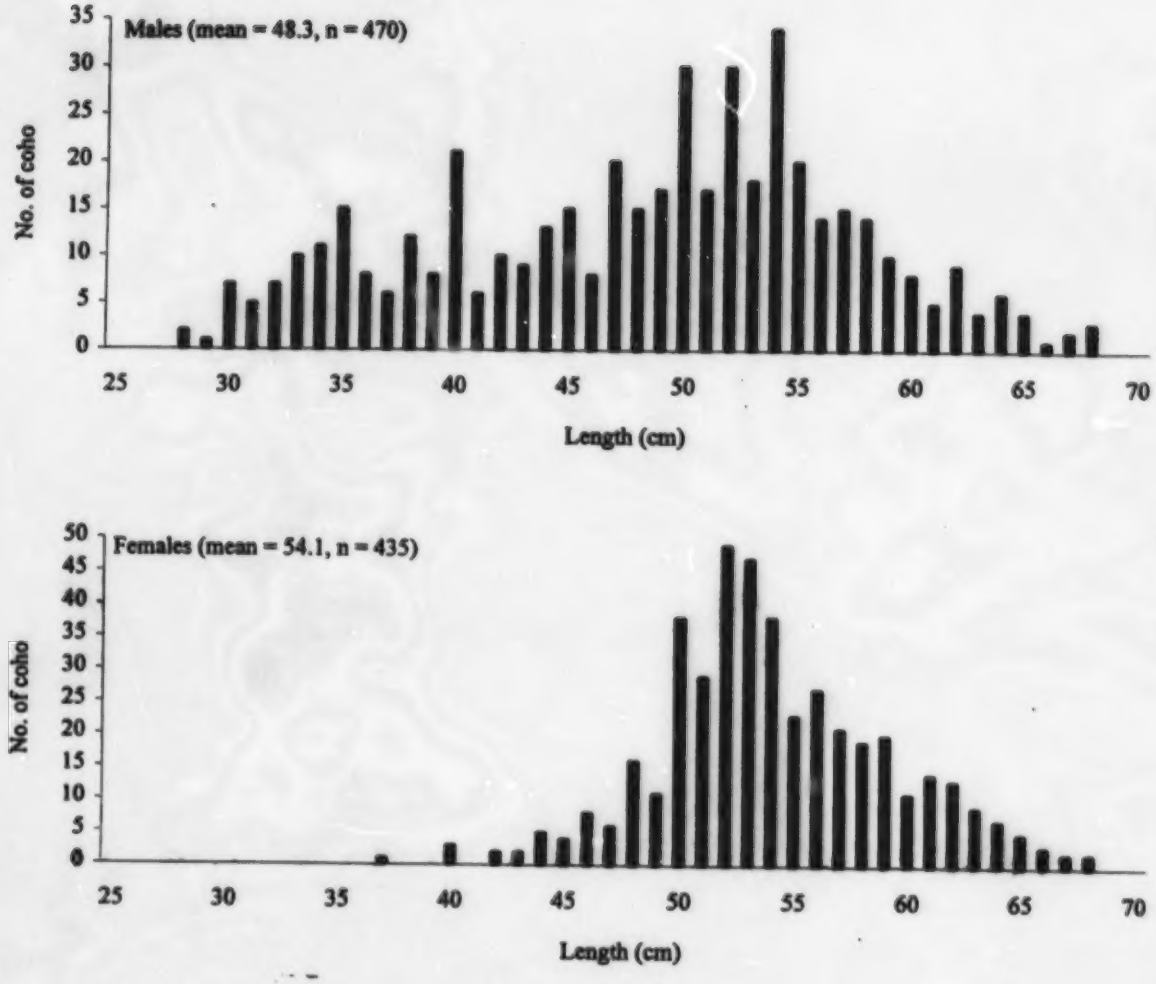

Figure 7. Length-frequency distribution of coho, by sex, Zolzap Creek, 1995.

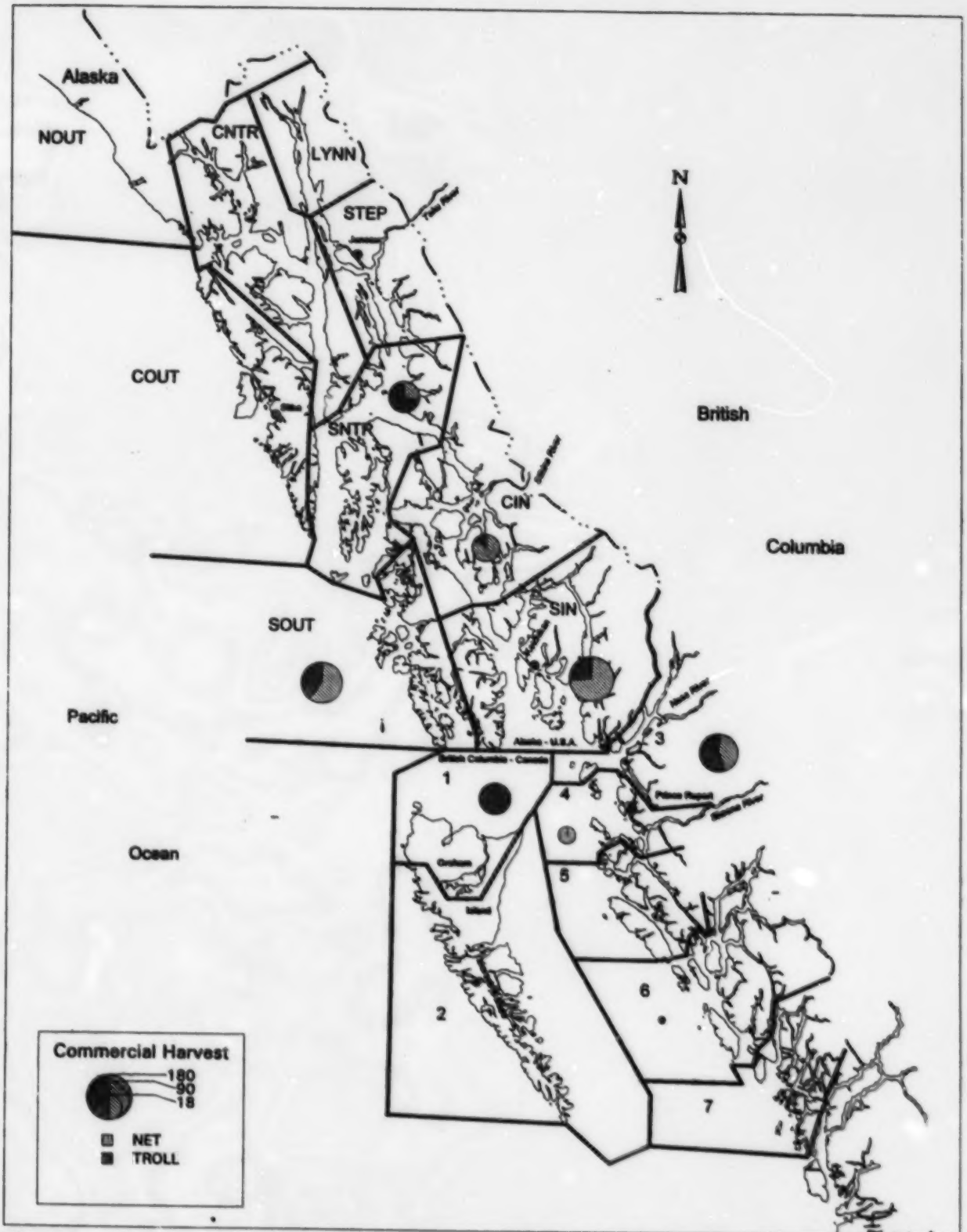

Figure 8. Fisheries Statistical Areas for the north coast of British Columbia and southeast Alaska, and commerical harvest distribution of Zolzap Creek CWT coho, 1995.

APPENDICES

Table A-1. Juvenile coho catch at Zolzap Creek enumeration fence, 1995.

Date		fry/presmolts	smolt
24-Apr		0	15
25-Apr		1	41
26-Apr		1	33
27-Apr		14	10
28-Apr		20	23
29-Apr		30	22
30-Apr		41	32
1-May		33	61
2-May		58	154
3-May		14	176
4-May		15	192
5-May		158	218
6-May		23	208
7-May		15	193
8-May		30	242
9-May		47	386
10-May		26	264
19-May		127	332
20-May		51	1551
21-May		32	678
22-May		31	392
23-May		61	546
24-May		84	873
25-May		280	311
26-May		84	815
27-May		9	210
29-May	a	0	13
30-May	a	0	87
31-May		259	261
1-Jun		556	437
2-Jun		787	515
3-Jun		582	514
4-Jun		328	552
5-Jun		292	365
6-Jun		183	505
7-Jun		23	102
8-Jun		185	598
9-Jun		190	509
11-Jun	a	1	26
12-Jun	a	0	19
13-Jun	a	0	0
14-Jun	a	56	6
15-Jun	a	156	70
Total		4883	12557

(a) captured using fyke net

Table B-1. Non-coho catch at Zolzap Creek enumeration fence, 1995.

Date	Steelhead		Cutthroat		D. Varden		Sockeye			
	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Cottid	Lamprey	Stickle
24-Apr	1	0	3	3	27	12	2	35	127	13
25-Apr	2	0	4	4	36	0	3	25	176	18
26-Apr	2	0	7	1	20	1	3	9	184	9
27-Apr	0	0	6	1	14	0	10	7	142	7
28-Apr	1	0	6	2	18	1	50	19	296	3
29-Apr	0	0	2	2	13	0	33	14	172	4
30-Apr	0	0	0	2	20	0	11	11	98	7
1-May	1	0	1	3	15	1	4	9	49	1
2-May	0	0	0	0	11	0	7	9	51	2
3-May	2	0	0	1	13	2	1	16	55	2
4-May	0	0	1	1	13	5	2	14	54	2
5-May	0	0	2	2	11	0	7	16	47	7
6-May	0	0	0	0	10	0	3	12	68	3
7-May	0	0	0	0	4	0	0	15	60	5
8-May	1	0	6	8	16	1	1	9	33	1
9-May	0	0	3	2	2	0	8	2	20	2
10-May	0	0	6	0	9	0	3	4	9	1
11-May	0	0	0	0	0	0	0	0	0	0
18-May	0	0	0	0	0	0	0	0	0	0
19-May	0	0	2	0	1	0	4	44	87	2
20-May	0	0	7	3	40	0	2	61	82	6
21-May	0	0	4	3	45	0	0	35	65	2
22-May	0	0	2	0	26	0	1	18	68	3
23-May	0	0	0	3	27	0	2	25	76	2
24-May	0	0	0	0	36	2	3	16	40	2
25-May	1	0	0	0	3	0	5	2	33	1
26-May	0	0	0	0	5	0	12	0	24	0
27-May	0	0	0	0	0	0	1	0	0	0
29-May	0	0	0	0	2	0	0	0	0	0
30-May	0	0	0	0	1	0	0	2	0	0
31-May	1	0	0	0	3	0	6	4	22	5

Table B-1. Non-coho catch at Zolzap Creek enumeration fence, 1995.

Date	Steelhead		Cutthroat		D. Varden		Sockeye			
	Juvenile	Adult	Juvenile	Adult	Juvenile	Adult	Juvenile	Cottid	Lamprey	Stickle
1-Jun	0	0	0	0	3	1	0	9	41	3
2-Jun	0	0	0	0	5	0	2	3	24	2
3-Jun	0	0	1	0	7	1	1	13	17	3
4-Jun	0	0	1	0	20	1	0	4	8	4
5-Jun	0	0	1	0	4	0	1	5	20	2
6-Jun	0	0	1	0	1	0	0	1	27	0
7-Jun	0	0	0	0	5	0	0	6	5	0
8-Jun	0	0	1	1	24	0	1	1	9	0
9-Jun	0	0	0	1	4	0	0	0	10	0
10-Jun	0	0	0	0	0	0	0	0	0	0
11-Jun	0	0	0	0	0	0	0	0	0	0
12-Jun	0	0	0	0	1	0	0	0	0	1
13-Jun	0	0	0	0	0	0	0	0	0	0
14-Jun	0	0	0	0	0	0	0	0	0	1
15-Jun	0	0	0	0	3	0	0	5	15	1
Total	12	0	67	43	518	28	189	480	2314	127

Table C-1. Coded-wire tagging data for coho smolts at Zolzap Creek, 1995.

Date	Total smolts	Fence morts	Tag code	No. AFC	Tag morts	No. rlsd. untagged	No. rlsd. AFC
24-Apr	15	0	0	0	0	15	0
25-Apr	41	0	0	0	0	41	0
26-Apr	33	1	0	0	0	0	0
27-Apr	10	0	0	0	0	0	0
28-Apr	23	0	182051	60	5	5	55
29-Apr	22	0	0	0	0	22	0
30-Apr	32	0	0	0	0	32	0
1-May	61	0	0	0	0	61	0
2-May	154	1	0	0	0	1	0
3-May	176	0	0	0	0	2	0
4-May	192	0	182051	433	16	85	417
5-May	218	1	0	0	0	0	0
6-May	208	0	182051	343	5	82	338
7-May	193	0	0	0	0	193	0
8-May	242	0	0	0	0	242	0
9-May	386	0	0	0	0	0	0
10-May	264	0	0	0	0	28	0
11-May	0	0	0	0	0	618	0
19-May	332	2	0	0	0	1	0
20-May	1551	0	182051	1819	7	37	1812
21-May	678	2	182051	651	5	21	646
22-May	392	1	182051	381	5	10	376
23-May	546	1	182051	531	5	13	526
24-May	873	0	182051	841	8	31	833
25-May	311	1	182051	154	5	156	149
26-May	815	1	182051	796	6	18	790
27-May	210	0	182051	203	0	5	203
29-May	13	0	0	0	0	13	0
30-May	87	0	0	0	0	87	0
31-May	261	0	182051	253	8	8	245
1-Jun	437	0	182051	419	5	18	414
2-Jun	515	0	182051	501	6	13	495
3-Jun	514	3	182051	503	6	8	497
4-Jun	552	0	182051	527	7	18	520
5-Jun	365	2	182051	354	6	8	348
6-Jun	505	0	182051	464	5	41	459
7-Jun	102	2	0	0	0	0	0
8-Jun	598	2	182051	626	6	70	620
9-Jun	509	0	182051	429	6	80	423
11-Jun	26	1	0	0	0	25	0
12-Jun	19	0	0	0	0	19	0
14-Jun	6	0	0	0	0	6	0
15-Jun	70	0	0	0	0	70	0
Total	12557	21	-	10288	122	2203	10166

Table D-1. Daily counts of adult coho at Zolzap Creek enumeration fence, 1995.

Date	No. examined	No. tagged
5-Sep	0	0
6-Sep	0	0
7-Sep	0	0
8-Sep	0	0
9-Sep	0	0
10-Sep	0	0
11-Sep		
12-Sep		
13-Sep		
14-Sep		
15-Sep	0	0
16-Sep	0	0
17-Sep	0	0
18-Sep	0	0
19-Sep	0	0
20-Sep	0	0
21-Sep	0	0
22-Sep	0	0
23-Sep	0	0
24-Sep	0	0
25-Sep	0	0
26-Sep	0	0
27-Sep	0	0
28-Sep	0	0
29-Sep	0	0
30-Sep	0	0
1-Oct	0	0
2-Oct	0	0
3-Oct	0	0
4-Oct	0	0
5-Oct		
6-Oct	0	0
7-Oct	0	0
8-Oct	0	0
9-Oct		
10-Oct		
11-Oct	0	0
12-Oct	0	0
13-Oct	0	0
14-Oct		
15-Oct		
16-Oct	0	0
17-Oct		
18-Oct		

Table D-1. Daily counts of adult coho at Zolzap Creek enumeration fence, 1995.

Date	No. examined	No. tagged
5-Sep	0	0
6-Sep	0	0
7-Sep	0	0
8-Sep	0	0
9-Sep	0	0
10-Sep	0	0
11-Sep	7	6
12-Sep	4	3
13-Sep	51	36
14-Sep	6	6
15-Sep	0	0
16-Sep	0	0
17-Sep	0	0
18-Sep	0	0
19-Sep	0	0
20-Sep	0	0
21-Sep	0	0
22-Sep	0	0
23-Sep	0	0
24-Sep	0	0
25-Sep	0	0
26-Sep	0	0
27-Sep	0	0
28-Sep	0	0
29-Sep	0	0
30-Sep	0	0
1-Oct	0	0
2-Oct	0	0
3-Oct	0	0
4-Oct	0	0
5-Oct	1	1
6-Oct	0	0
7-Oct	0	0
8-Oct	0	0
9-Oct	16	15
10-Oct	10	9
11-Oct	0	0
12-Oct	0	0
13-Oct	0	0
14-Oct	490	483
15-Oct	35	34
16-Oct	0	0
17-Oct	100	99
18-Oct	75	75

Table D-1. Daily counts of adult coho at Zolzap Creek enumeration fence, 1995.

Date	No. examined	No. tagged
19-Oct	15	13
20-Oct	0	0
21-Oct	0	0
22-Oct	0	0
23-Oct	1	1
24-Oct	0	0
25-Oct	0	0
26-Oct	25	24
27-Oct	41	39
28-Oct	3	3
29-Oct	0	0
30-Oct	0	0
31-Oct	0	0
1-Nov	0	0
2-Nov	0	0
3-Nov	0	0
4-Nov	8	8
5-Nov	3	3
6-Nov	1	1
7-Nov	0	0
8-Nov	0	0
9-Nov	0	0
10-Nov	0	0
11-Nov	0	0
12-Nov	0	0
13-Nov	0	0
14-Nov	0	0
15-Nov	0	0
16-Nov	0	0
17-Nov	2	2
18-Nov	0	0
19-Nov	0	0
20-Nov	0	0
21-Nov	0	0
22-Nov	4	4
23-Nov	0	0
24-Nov	3	3
25-Nov	4	4
26-Nov	3	3
27-Nov	0	0
28-Nov	0	0
29-Nov	0	0
30-Nov	0	0
1-Dec	0	0

Table D-1. Daily counts of adult coho at Zolzap Creek enumeration fence, 1995.

Date	No. examined	No. tagged
19-Oct	[redacted]	
20-Oct	0	0
21-Oct	0	0
22-Oct	0	0
23-Oct	[redacted]	
24-Oct	0	0
25-Oct	0	0
26-Oct	[redacted]	
27-Oct		
28-Oct		
29-Oct	0	0
30-Oct	0	0
31-Oct	0	0
1-Nov	0	0
2-Nov	0	0
3-Nov	0	0
4-Nov	[redacted]	
5-Nov		
6-Nov		
7-Nov	0	0
8-Nov	0	0
9-Nov	0	0
10-Nov	0	0
11-Nov	0	0
12-Nov	0	0
13-Nov	0	0
14-Nov	0	0
15-Nov	0	0
16-Nov	0	0
17-Nov	[redacted]	
18-Nov	0	0
19-Nov	0	0
20-Nov	0	0
21-Nov	0	0
22-Nov	[redacted]	
23-Nov	0	0
24-Nov	[redacted]	
25-Nov		
26-Nov		
27-Nov	0	0
28-Nov	0	0
29-Nov	0	0
30-Nov	0	0
1-Dec	0	0

Table D-1. Daily counts of adult coho at Zolzap Creek enumeration fence, 1995.

Date	No. examined	No. tagged
2-Dec	0	0
3-Dec	0	0
4-Dec	0	0
5-Dec	0	0
Totals	908	875